

APPENDIX I

Evaluation of Surface Water Availability

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EXECUTIVE SUMMARY

The South Florida Water Management District (SFWMD or District) has conducted studies of East Lake Tohopekaliga (East Lake Toho), Lake Tohopekaliga (Lake Toho) and the major tributaries including Boggy and Shingle creeks to provide a preliminary evaluation of the surface water availability within the Upper Kissimmee Basin.

This technical memorandum summarizes the purpose, analysis and results of *A Preliminary Evaluation of Available Surface Water in Lake Tohopekaliga and East Lake Tohopekaliga* (Cai 2005) and *A Preliminary Evaluation of Available Surface Water in Boggy and Shingle Creeks* (Cai 2005). The purpose of this evaluation is to identify the potential availability of water from the upper basin surface water system, to identify environmental considerations to address in withdrawing water and to characterize the technical issues associated with such a withdrawal.

An analysis performed as part of the *2000 Kissimmee Basin Water Supply Plan* (KB Plan) identified possible risks that may result from future groundwater withdrawals in central Florida. The KB Plan recommended developing alternative water sources that would reduce future dependence on the Floridan Aquifer in areas contributing to the projected resource harm. Surface water was identified as one of the possible alternative sources. Recommendation 3.1 of the 2000 KB Plan suggested performing a water availability study to evaluate the surface water systems in the Upper Kissimmee Basin.

A Preliminary Evaluation of Available Surface Water in East Lake Tohopekaliga and Lake Tohopekaliga

In conducting the current evaluation, it was assumed that water above current flood control regulation schedules for Lake Tohopekaliga and East Lake Tohopekaliga is available for water supply uses without harm to in-lake resources. This study uses a test scenario in which a maximum of 50 MGD from Lake Toho and East Lake Toho (separately) is withdrawn. The potential effects on lake levels and downstream releases are evaluated. In addition, a 100 MGD regulation schedule controlled scenario and a 50 MGD historical stage controlled scenario were simulated to compare the effects of increasing diversions and altering the withdrawal control method on lake levels and downstream discharges.

The withdrawal scenarios were simulated using two water balance models developed for the District. These models include the Upper Kissimmee Chain of Lakes Routing Model (UKISS Model) originally developed for the Headwater Revitalization Project and Lake Istokpoga Operation System Model (LIOS Model), a tool initially developed to review operational system changes on Lake Istokpoga. The later of these

two was modified for use in this evaluation. Results of the modeling were evaluated based on in-lake changes and changes in downstream flow south of the S-65 Structure.

The modeling effort suggests that storage will need to be addressed in any diversion system proposed for the lakes. Storage options include reservoirs, underground storage (aquifer storage and recovery) and storage within the chain of lakes themselves by altering the regulation schedules. Under a separate analysis, the District evaluated the reservoir storage needed to improve system reliability to over 90 percent. This evaluation estimates that a reservoir storage requirement of 9,000 acre-feet and a reduction of withdrawals to 25 MGD would produce a 95 percent reliable system.

Results of this evaluation suggest that a reliability of 65 percent or less can be achieved, while withdrawing water from the lakes under the maximum diversion of 50 MGD scenario. The total diverted amount of water can vary greatly from year to year and could include extended periods of restricted withdrawals lasting several weeks. This withdrawal pattern is also expected to impact flow patterns below the S-65 Structure by increasing the number of no-flow events by 25 percent and the maximum duration event by 7 percent. Historically, staged based withdrawal scenarios showed an improvement in the withdrawal reliability curve over regulation-controlled scenarios, but still caused an increase of 16 percent in the number of no-flow days in downstream releases. Increasing the withdrawal rates to 100 MGD caused only slight changes in the reliability curve and downstream discharge flow values from those produced in the 50 MGD scenario.

A Preliminary Evaluation of Available Surface Water in Boggy and Shingle Creeks

Much of the storm water generated in southern Orange County and northern Osceola County drains towards one of three basins: Boggy Creek, Shingle Creek and Reedy Creek basins. This study represents a planning-level evaluation of the surface water resources from the Boggy Creek and Shingle Creek basins to identify potential water supply availability. This study does not include an evaluation of the Reedy Creek Basin as the environmental information for this basin was not available.

The current study involved the collection of climatic and hydrologic data, identification of environmental issues, field reconnaissance of local wetland systems, tool development and identification of engineering issues needed to improve withdrawals. To conduct this evaluation, the SFWMD made assumptions about the manner in which withdrawals might occur and the way environmental issues might be addressed.

Evaluating water availability in these creeks was done using statistical methods and a pre-existing model, originally developed to evaluate management alternatives for the Kissimmee Chain of Lakes as part of the Kissimmee River Restoration. These tools were used to simulate 32 years of historic climatic and operational conditions. Two separate calculations evaluated environmental impacts, one for in-basin concerns and the other addressing downstream lake levels and restoration efforts.

Available surface water for withdrawal from Boggy and Shingle creeks is estimated at 2 and 6 million gallons per day (MGD) respectively. The evaluation also demonstrated however, that the withdrawal reliability was in question. The evaluation showed that over the 32-year demonstration period, the reliability of the withdrawals was at best 85 percent during the wet season and was reduced to 50 percent or less during the dry season. Restoring hydrologic conditions in these wetlands may lead to improved water availability in the creeks during the wet season. Water availability in Boggy and Shingle creeks during the dry season is limited by ecosystem health concerns in the downstream environment. Incorporating elements of storage is expected to improve system reliability. Evaluating alternative withdrawal options for the Kissimmee Chain of Lakes withdrawals may improve dry season reliability.

The results of this evaluation, while preliminary, suggest that significant volumes of water might be withdrawn from Boggy and Shingle creeks, while causing minor changes to the environmental health. This suggests the need for further investigation of these surface water resources. The SFWMD is developing a long-term management plan for the Kissimmee Chain of Lakes and its tributaries. A full evaluation of the surface water supply potential for the Upper Kissimmee Basin is recommended.

Summary

These studies did not try to find the optimum withdrawal scenario to maximize withdrawals, but characterized the magnitude of potential water supply availability from the surface water systems.

Future evaluations of water availability for the Kissimmee Chain of Lakes system should rely on modeling that allows for the simultaneous simulation of lake levels and system flow discharges. This will provide a more accurate solution, while allowing flexibility in solution development.

The concerns identified in this study are not the only limiting resource matters to consider in making a final determination of water availability. Any system devised for withdrawing water from these surface water sources will need to include environmental, economic, navigational and water quality concerns within and downstream of the basin.

The water system for the Kissimmee Chain of Lakes, the Kissimmee River and connection with Lake Okeechobee is a complex hydrologic system. The management of this system is a balance of many objectives. The District began efforts to develop a long-term management plan for the Kissimmee Chain of Lakes and its tributaries in 2004. This evaluation will address many of the issues necessary to balance water supply demands with environmental and urban needs. The District has recommended that a full evaluation of the potential consumptive use availability from the Upper Kissimmee Basin be made in union with efforts of the *Kissimmee Chain of Lake Long-Term Management Plan*.

References Cited

Cai, J. 2005. *Technical Memorandum: A Preliminary Evaluation of Water Availability in East Lake Tohopekaliga and Lake Tohopekaliga*. SFWMD, West Palm Beach, FL.

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